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THE PLACE OF LAMARCK IN THE HISTORY OF EVOLUTION.

Lamarck, the Founder of Evolution; his Life and Work. With Translations of his Writings on Organic Evolution. By Alpheus S. Packard, M.D., LL.D., Professor of Zoology and Geology in Brown University, &c. Pp. xiv + 451. (London and New York: Longmans, Green and Co., 1901.) Price 9s. net.

THE name of Lamarck has of late been much in people's mouths. Now that the doctrine of organic evolution has secured acceptance from all those who are qualified to form an opinion on the subject, an attempt is being made in some quarters to deprive Darwin, the real hero of the campaign, of at least a portion of his laurels, and to bestow them on a leader of inferior rank and far lower achievement. It cannot be doubted that this attempt is, in the long run, doomed to failure; but in the meantime there is considerable danger of an unwholesome reaction among those who have not perfectly comprehended the points at issue.

It is often forgotten that the idea of "special creation," or, as we should rather say, of the "immutability of species," is one of comparatively recent growth. Before the seventeenth century the current notions on this subject were by no means rigid, while the terms "genus" and "species," in their technical use, were the exclusive property of logicians. It is not until the time of Ray that we find the latter term borrowed by a naturalist in order to give precision to a conception which was then a novelty to the scientific mind. The definition of natural species in the Linnæan sense would have sounded as strange in the ears of Francis Bacon as would the denial of spontaneous generation. The work of Ray, Linnæus and Cuvier, greatly as it assisted the cause of science, carried with it a fatal defect. It left order where it had found confusion, but in substituting exactness of definition for the vague conceptions of a former age, it did much to obscure the rudimentary notions of organic evolution which had influenced naturalists and philosophers from Aristotle downwards.

Nevertheless, the old transformist beliefs, though no longer popular, were not left quite without a witness. Buffon, being possibly influenced by considerations other than scientific, vacillated, as is well known, between the theories of mutability and fixity of species. Erasmus Darwin, on the other hand, was a vigorous and outspoken upholder of the transformist opinion, shorn of some, but not all, of its former crudities. Geoffroy St. Hilaire declared in favour of the derivation of different species from the same type; and six years later Lamarck, who had previously taught the fixity of species, announced his adherence to the evolutionary view. The author of the "Vestiges of Creation" and Herbert Spencer may be said in some sort to have carried on the transformist succession, but it was reserved for Charles Darwin and Alfred Russel Wallace to import into the problem an entirely fresh set of considerations, and by means of a new and illuminating theory, supported on a secure basis of fact, to win universal acceptance for a doctrine which all

the skill and eloquence of its former advocates had failed to commend to the scientific world.

Prof. Packard, on the title-page of the present work, calls Lamarck "the founder of evolution." If the foregoing may be taken as a not unfair presentment of the course of opinion on the subject of transformism, it is difficult to see how such a claim can be justified. It is idle to discuss whether or not Lamarck was acquainted with the works of Erasmus Darwin. Transformism was in the air, and it is impossible to credit Lamarck with the origination of a view which had been present to the minds of Geoffroy St. Hilaire and of Buffon. Neither can it be said that Lamarck's advocacy won general approval for a doctrine that was previously discredited. The strength of his own convictions and the persistence with which he urged them are not in question; but the fact that he failed to convert either his contemporaries or his successors is equally indisputable. The only ground on which, if on any, the claim advanced on behalf of Lamarck can be sustained is the allegation that he was the first to render the doctrine of transmutation credible by pointing out the methods on which organic evolution has proceeded. Much, no doubt, depends on the acceptance or rejection of the so-called "Lamarckian factors." In the earlier stages of the present phase of the evolutionary controversy, these factors were somewhat uncritically accepted as adjutants to the theory of natural selection propounded by Darwin and Wallace. But when the belief in the inheritance of acquired characters had once been seriously called in question, it was speedily perceived that no logical necessity existed for evolutionists to accept these factors at all. The question became clearly one of evidence; and in the opinion of many, if not most, of the leaders of scientific thought, the upholders of the Lamarckian view have so far failed to deal successfully with the burden of proof that undoubtedly rests upon them. The hereditary transmission of individually acquired characters is a necessary part of the Lamarckian system, and until this point is established to the satisfaction of scientific opinion, it is at least premature to hail Lamarck as in any sense the founder of organic evolution. And even should the proof be forthcoming, the facts would still remain that many of Lamarck's views had been already foreshadowed, that his system contains much speculation unsupported by adequate evidence, and much that is demonstrably erroneous; moreover, that it failed in any appreciable degree to influence his contemporaries.

It is hardly necessary to point out how complete a contrast to this is afforded by the history of Darwinism. Founded on a basis of observation and experiment to which the Lamarckian speculations can lay no claim, and calling in the aid of a principle—that of natural selection—which, given the observed facts of variation, actually showed how the adaptation everywhere manifest in nature might have been brought about, the Darwinian system supplied an element of rationality which had hitherto been absent, and compelled the attention of those to whom the unsupported hypotheses of previous transformists had failed to appeal. The importance of Darwin's work is seen in its results. Under the influence of the "Origin of Species," Huxley, Lyell, Hooker and Asa Gray ranged themselves on the side of evolution; I

the whole of the scientific world, with few exceptions, followed their example, and before his death Darwin had the satisfaction of knowing that the doctrine of evolution had become almost a commonplace in the minds of the reflecting and cultivated portion of the community.

Lamarck was unquestionably a capable, industrious and enthusiastic naturalist. He possesses the merit of having grasped the truth of organic evolution, though his views as to its methods were crude and his arguments in its favour unsubstantial. He also carried out the principle on a far larger scale and with greater amplification of detail than did any of his transformist predecessors, and to him we owe the first attempt at the construction of a scheme of phylogeny. But while we readily allow all this, it seems to us, for the reasons above given, that in the present work the importance of Lamarck and of his contribution to the progress of evolutionary theory is greatly over-estimated. Nevertheless, in putting before us within reasonable compass a careful and critical account of the little that is known of the life and circumstances of Lamarck, and of his relations with the leaders of scientific thought in France during a period which is full of interest, Dr. Packard has done real service. He seems inclined to complain that writers on evolution "do not know their Lamarck." Whether this be true or not, the extracts from Lamarck's writings here given are so representative and so copious that there will in future be no excuse for ignorance as to what Lamarck's tenets really were. It may be doubted whether the well-known chapters in Lyell's "Principles" do not really contain all that is requisite for forming a working estimate of the Lamarckian doctrine. But there are some to whom, for various reasons, a more extended acquaintance with this doctrine will be necessary, and who yet possess neither the time nor the opportunity for attacking the works of Lamarck in their original form. To such readers, if they are willing to show indulgence towards a certain amount of needless repetition and some occasional inaccuracy in translation and other matters, Dr. Packard's interesting and thorough-going volume may be recommended with confidence. F. A. D.

ELEMENTARY CHEMISTRY.

Elementary Inorganic Chemistry. By James Walker, D.Sc., Ph.D., F.R.S. Pp. 265. (London: George Bell and Sons, 1901.) Price 3s. 6d.

Experimental Chemistry. By Lyman C. Newell, Ph.D., State Normal School, Lowell, Mass. Pp. xv + 410. (London: D. C. Heath and Co., 1902.) Price 5s.

Elementary Experimental Chemistry. By W. F. Watson, A.M., Furman University, South Carolina. Pp. 320. (New York: A. S. Barnes and Co., 1901.) Price 7s. net.

THE first of these books may be said to meet a distinct want, felt in this case by others than the author, and to meet it extremely well. It is an elementary treatise on chemistry imbued with the spirit of the times, but written with restraint and marked by the lucid and philosophic style characteristic of the best class of scientific writing. It is not an ancient garment embroidered with new ions, nor is it an aggravated *bouleversement* of the chemistry that was presented to

us twenty years ago. It would probably do most chemists good to read it, and it is admirably adapted as a first college book for students. It contains the essentials of chemical theory and a really judicious selection of chemical facts, and it is to be commended, perhaps, most of all to examiners, whose sins in asking for unimportant facts abate but slowly. It is no book for those who have to charge their memories with Dutch liquid, puce-coloured oxide of lead and powder of Algaroth; yet it does not relegate the conception of mass action and reversible changes to a period of grave and senior study. It is, in fact, a book which can be unreservedly recommended, and Prof. Walker deserves our thanks for having written it.

Dr. Newell's book is a thoughtful and interesting attempt to improve upon the older kind of text-book, and the author endeavours to interweave a laboratory course with adequate descriptive matter. It is difficult to judge such a book fairly without putting it to practical use, but there seems every prospect that by using it as the author intends it to be used the student would be brought to the right view of chemical science and to a sound knowledge of the leading principles and facts. The book abounds in practical and theoretical problems, and encouragement is given to the discussion of laboratory results in class—a most valuable form of teaching. There is a tendency in books of this kind for some of the statements, questions and injunctions to become a little puerile, and to conjure up a picture of ingenuousness which, in the present writer's experience, is not often found in real life, at least among male students. However, there is not very much to complain of in this way. The book has obvious merits, and the author may fairly claim that it deserves a trial.

The third work under review is intended especially for students who only take one short course of chemistry. A reviewer will, according to his disposition, be either intimidated or exasperated by the author's statement that he is "profoundly grateful to ten different educators for reading the proof sheets and making valuable suggestions." To make any objections after this announcement seems perhaps rash; but at whatever cost, the author and the ten educators must be faced with the statement that to an eleventh educator the book has proved disappointing. The introduction to the work comprises ten pages, and it consists of a series of statements defining matter, chemical compounds and mechanical mixtures, atoms, molecules, indestructibility of matter and conservation of energy. It is difficult to know what purpose is served by confronting the student at the very outset of chemical study with a series of dogmas such as are found here. The idea of the atom, for instance, is introduced by the statement that "a single symbol as C and Cl indicates *one atom* of the element." Immediately upon this comes "An atom is the smallest portion of matter that can take part in a chemical change. It is indivisible."

The atom being thus disposed of, the molecule is dealt with in like fashion. It is really astonishing to find this kind of thing in a book with such pretensions as are set forth in the preface. The rest of the book is of the same mould; there is nothing to distinguish it from dozens of other elementary chemical books of the kind that in this country have had their day and are happily